

REMARKS

Applicants thank the Examiner for the courtesy extended to Applicants' attorney during the interview held January 24, 2002, in the above-identified application. During the interview, Applicants' attorney explained the presently-claimed invention and why it is patentably over the applied prior art, and discussed other issues raised in the Office Action. The discussion is summarized and expanded-upon below.

As recited in Claim 1 as amended, the present invention is a ceramic heater comprising a ceramic substrate and a temperature control means, wherein said ceramic substrate has 15×10^{11} or less pores which have a diameter of $0.5 \mu\text{m}$ or more per m^2 by surface measurement with a microscope.

Applicants have discovered that when the ceramic substrate satisfies the above-recited "pore" limitation, it is possible to successfully address various problems in prior art ceramic substrates, such as temperature rising/dropping characteristics which are insufficient, breakdown voltage droppage at high temperature, and warp caused by Young's modulus droppage.

Note that with the presently-recited pore limitation, the drop in breakdown voltage is suppressed even in the high temperature range of 200°C or higher. For example, as shown in Table 1 at page 34 of the specification, the breakdown voltage at a temperature of 200°C is 4kV/mm when the number/ m^2 of pores is 10×10^{11} (Example 7) whereas the breakdown voltage at 200°C is 0.8kV/mm when the number/ m^2 of pores is 18×10^{11} (Comparative Example 1). These examples demonstrate that the value of the breakdown voltage dramatically drops between these number/ m^2 values. Thus, when the number/ m^2 of pores is 15×10^{11} or less, it is possible to secure sufficient breakdown voltage at 200°C or more.

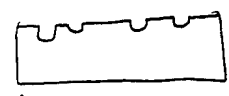
The rejection of Claim 1 under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over, U.S. Patent No. 5,338,598 (Ketcham), is respectfully traversed. Ketcham is directed to a sintered body for use as, for example, composite armor, cutting tools, high temperature structural materials and/or wear parts for air-frames or heat engines, electrically-insulating substrates for integrated circuits, and precision parts such as magnetic head sliders (paragraph bridging columns 11 and 12). The Examiner particularly relies on Ketcham's disclosure of "essentially zero open porosity" (column 3, line 43), as meeting the presently-recited "pore" limitation, which does not exclude a non-porous condition. However, Ketcham neither discloses nor suggests a ceramic heater, let alone one comprising the presently-recited ceramic substrate and temperature control means, which requires an insulation property at high temperature. Nor could one skilled in the art have predicted the above-discussed comparative data from the disclosure of Ketcham.

②
piece meal argument

For all of the above reasons, it is respectfully requested that the rejection over Ketcham be withdrawn.

The rejection of Claim 1 under 35 U.S.C. §112, second paragraph, is respectfully traversed. The Examiner requires clarification with regard to the above-discussed "pore" limitation, since it is recited in terms of a two-dimensional unit, while pores would be expected to be, in effect, three-dimensional. In response, and as disclosed in the specification, the "pore" limitation is measured by the use of a microscope in which the number of pores having a diameter of $0.5 \mu\text{m}$ or more are observed on the surface, which is polished into a mirror plane, of a sample prepared by cutting, and counted, as described in the specification at page 8, lines 24-33, and page 31, lines 17-28. During the above interview,

Only to the surface



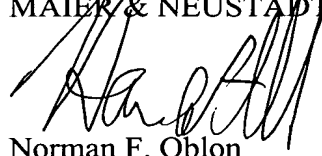
thus it's /m²

the Examiner indicated that this rejection would be withdrawn provided the above explanation were provided. Accordingly, it is respectfully requested that it be withdrawn.

All of the presently-pending claims in this application are believed to be in condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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Amendment Filed on:

Herewith

IN THE CLAIMS

Please amend Claim 1 as follows:

--1. (Amended) A ceramic heater comprising a ceramic substrate [having a conductor formed on the surface thereof or inside thereof] and a temperature control means,

[characterized in that] wherein said ceramic substrate [is having] has 15×10^{11} or less pores which have a diameter of $0.5 \mu\text{m}$ or more per m^2 by surface measurement with a microscope.

Claims 2-12 (New).--

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